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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|------------------------------------|-------------|----------------------|---------------------|------------------|
| 10/561,361 | 12/19/2005 | Jill MacDonald Boyce | PU030180 | 9742 |
| 24498 | 7590 | 05/11/2010 | | |
| Robert D. Shedd, Patent Operations | | | EXAMINER | |
| THOMSON Licensing LLC | | | ROBERTS, JESSICA M | |
| P.O. Box 5312 | | | | |
| Princeton, NJ 08543-5312 | | | ART UNIT | PAPER NUMBER |
| | | | 2621 | |
| | | | MAIL DATE | DELIVERY MODE |
| | | | 05/11/2010 | PAPER |

Please find below and/or attached an Office communication concerning this application or proceeding.

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/561,361
Filing Date: December 19, 2005
Appellant(s): BOYCE ET AL.

Jeffery Navon (Reg. No. 32,711)
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 01/20/2010 appealing from the Office action mailed 06/20/2009.

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The following is a list of claims that are rejected and pending in the application:

Claims 1 and 3-22 are currently pending. Claims 1 and 3-22 stand rejected.

(4) Status of Amendments After Final

The examiner has no comment on the appellant's statement of the status of amendments after final rejection contained in the brief.

(5) Summary of Claimed Subject Matter

The examiner has no comment on the summary of claimed subject matter contained in the brief.

(6) Grounds of Rejection to be Reviewed on Appeal

The examiner has no comment on the appellant's statement of the grounds of rejection to be reviewed on appeal. Every ground of rejection set forth in the Office action from which the appeal is taken (as modified by any advisory actions) is being maintained by the examiner except for the grounds of rejection (if any) listed under the subheading "WITHDRAWN REJECTIONS." New grounds of rejection (if any) are provided under the subheading "NEW GROUNDS OF REJECTION."

(7) Claims Appendix

The examiner has no comment on the copy of the appealed claims contained in the Appendix to the appellant's brief.

(8) Evidence Relied Upon

| | | |
|-----------|-------|---------|
| 6,118,817 | Wang | 09-2000 |
| 5,978,029 | Boice | 11-1999 |
| 7,016,337 | Wu | 03-2006 |

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1, 3-22 are rejected under 35 U.S.C 103(a) as being unpatentable over Wang et al., US 6,118,817 in view of Boice et al., 5,978,029 as applied to claim 1 above and further in view of Wu et al., US 7,016,337.

4. Regarding claim 1, Wang teaches an encoder (fig. 1) for encoding a sequence of pictures as a plurality of block transform coefficients (direct cosine transformation (DCT) on the motion-compensated macroblocks of the motion-compensated frame to produce a transformed frame, column 6 line 56-59 and fig. 1) to meet network traffic model restrictions (motion video signal encoder maximizes image quality without exceeding transmission bandwidth available, See abstract), the encoder comprising an iterative loop for selecting one of a plurality of quantization parameter values for each picture (a primary open rate loop control selects an optimized quantization parameter Q by determining a desired size for an individual frame, column 4 line 14-16. Furthermore, the examiner takes the position that a loop is a reiteration of a set of instructions in a routine or program), said iterative loop comprises: selecting means for selecting each picture of the sequence one of the plurality of quantization parameter values responsive to the quantization parameter values and bitrate operating points of the neighboring pictures in a predetermined time window. However, Wang is silent in regards to a pre-encoding means for pre-encoding the sequence of pictures for each of a plurality of quantization parameter values; encoding means for encoding each picture the sequence using the quantization parameter value selected for that picture.

5. However, Boice teaches a pre-encoding means for pre-encoding the sequence of pictures for each of a plurality of quantization parameter values (Using the calculated statistics, adaptive encoding of the video sequence is then carried out by controlling one or more encoding parameters of the real-time process. For example, bit allocation, quantization parameter(s), encoding mode, etc., can be changed from frame to frame or macroblock to macroblock within a given frame according to derived statistics of a characteristic (e.g., scene content) of the particular frame(s), column 7 line 30-39. Further disclosed, is encoder subsystem E1 is programmed to generate the desired statistics, which are important to the encoding subsystem's (E2) specific bit rate control algorithm, column 7 line 50-52 and column 8 line 1-5. Therefore, it is clear to the Examiner that encoder #1 (E1) and controlling processor combined allow for pre-encoding; and the; encoding means for encoding each picture the sequence using the quantization parameter value selected for that picture (Boice teaches the statistical processing is accomplished within a processor coupled between the first and second encoder and to develop encoding parameters for the second encoder. The second encoder then uses the enhanced encoding parameters to provide high quality and highly compressed video stream, column 4 line 29-35, fig. 7-8).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Wang with the technique of Boice for enhancing picture quality of an encoded video sequence while still obtaining a high compression rate by providing a real-time VBR a video encoding scheme.

Wang (modified by Boice) is silent in regards to predetermined time window technique, however Wu teaches where an encoder employs a “look a-head window” that is used to determine at what rate each channel must be sent. The “look a-head window” is used with the statistical re-multiplexer to determine to send out a number of bits corresponding to a time T for each of the channels, column 13 lines 65-67 and column 14 lines 1-20 and fig. 11.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of both Wang and Boice with the technique of Wu for providing a system that ensures that the bit rate of transmission matches the channel capacity.

6. Regarding claim 3, Wang (modified by Boice and Wu) as a whole teaches everything as claimed above, see claim 1. In addition, Wang teaches An encoder (Wang, fig. 1) as defined in claim 2 wherein the quantization parameter value selected for the time window encodes a window's worth of pictures at about a target picture rate (Wang discloses the use of a frame rate controller **120** to control the frame rate of the encoded video signal, column 15 line 18-20). Further disclosed by Wang is that the frame rate controller compares the cumulative bandwidth balance to a maximum threshold which is periodically adjusted by frame rate controller and depends upon the current frame rate at which video signal encoder is encoding frames, column 15 line 28-36. Therefore, it is clear to the examiner since the frame rate controller has both a maximum and minimum threshold value for the encoder to use while encoding video

frames, would be a functional equivalent of the time window for flow control for the transformation of data, which reads upon the claimed limitation).

7. Regarding claim 4, Wang (modified by Boice and Wu) as a whole teaches everything as claimed above, see claim 1. Wang is silent in regards to an encoder as defined in claim 1 wherein the quantization parameter value selected for the time window encodes a window's worth of pictures at about a target bitrate (Boice teaches where the controlling processor provides quantization parameters to the second subsystem, and E1 (the first subsystem) provides this into E2 (the second subsystem), where E1 produces information on scene change, quality, bits used and target bit rate, column 4 line 34-43). Therefore, it is clear to the examiner that the subsystem as disclosed by Boice would be capable of providing the target bit rate for the sliding window as disclosed by Wu to allow for encoding of a windows worth of pictures.

8. However, Boice teaches wherein the quantization parameter value selected for the time window encodes a window's worth of pictures at about a target bitrate (Boice teaches where the controlling processor provides quantization parameters to the second subsystem, and E1 (the first subsystem) provides this into E2 (the second subsystem), where E1 produces information on scene change, quality, bits used and target bit rate, column 4 line 34-43). Therefore, it is clear to the examiner that the subsystem as disclosed by Boice would be capable of providing the target bit rate for the sliding window as disclosed by Wu to allow for encoding of a windows worth of pictures.

9. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of Boice with Wang (modified by Wu) for enhancing picture quality of an encoded video sequence while still obtaining a high compression rate.

10. Regarding claim 5, Wang (modified by Boice and Wu) as a whole teaches everything as claimed above, see claim 1. Wang is silent in regards to An encoder as defined in claim 1 wherein the quantization parameter values selected for each picture in the video sequence and for the neighboring pictures in the same time window as the given picture are chosen to encode the pictures to be transmitted within a time window of preset duration to be encoded within a target number of bits.

11. However, Wu discloses where the second output of the video scene analyzer is coupled to the input of the compressor. The second output provides the video data and relevant timing information so that it can be used by the compressor to provide a bit stream at a desired target bit rate, column 9 lines 25-31). Further disclosed by Wu is the use of a scheduler with the multiplexer to provide an output bit stream at a given rate (see abstract, column 13 lines 43-45 and fig. 10).

12. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of Wu with Wang (modified by Boice) for providing a system that ensures that the bit rate of transmission matches the channel capacity.

13. Regarding claim 6, Wang (modified by Boice and Wu) as a whole teaches everything as claimed above, see claim 1. Wang is silent in regards to an encoder as

defined in claim 1 wherein the sequence of video pictures comprises a group of pictures.

14. However, Boice teaches wherein the sequence of video pictures comprises a group of pictures (Boice, GOP, column 8 line 11).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Wang with the technique of Boice for enhancing picture quality of an encoded video sequence while still obtaining a high compression rate by providing a real-time VBR a video encoding scheme.

15. Regarding claim 7, Wang (modified by Boice and Wu) as a whole teaches everything as claimed above, see claim 1. Wang is silent in regards to wherein the sequence of video pictures comprises pre-stored video content.

16. However, Boice teaches wherein the sequence of video pictures comprises pre-stored video content. (Boice, the input pictures must be temporarily stored until used for encoding, column 6 line 3-5).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Wang with the technique of Boice for enhancing picture quality of an encoded video sequence while still obtaining a high compression rate by providing a real-time VBR a video encoding scheme.

17. Regarding claim 8, Wang (modified by Boice and Wu) as a whole teaches everything as claimed above, see claim 1. Wang is silent in regards to an encoder as defined in claim 1 wherein a portion of sequence of video pictures to be transmitted

within preset time duration meets a network traffic model restricting the number of bits to be transmitted within the preset time duration.

18. However, Wu teaches wherein a portion of sequence of video pictures to be transmitted within preset time duration meets a network traffic model restricting the number of bits to be transmitted within the preset time duration (Wu discloses where the look-ahead window is used with the statistical re-multiplexer may decide to send out number of bits corresponding to a time T_1 for each of the channels, where T_1 may be less than or equal to T . For the case $T_1 < T$, the statistical re-multiplexer 504 examines the input bit streams from all different programs in an interval T , and only sends out T , part of the data. In the next iteration, the statistical re-multiplexer 504 examines the data after $T_{sub.1}$, and the examining data period still uses a time window size of T , column 14 lines 3-18). Therefore, it is clear to examiner that by limiting and sending out just part of the data within a set time window size would restrict the data to meet network traffic, which reads upon the claimed limitation.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching Wang (modified by Boice) with the technique of Wu for providing a system that ensures that the bit rate of transmission matches the channel capacity.

19. Regarding claim 9, Wang (modified by Boice and Wu) as whole teaches everything as claimed above, see claim 1. In addition, Wang teaches an encoder (Wang, fig. 1) as defined in claim 1 wherein the selecting means for selecting one of the plurality of quantization parameter values for each picture of the video sequence

(Wang, primary open loop rate control, column 4 line 14-30) to optimize the quantization parameter value selected to encode each picture (Wang, If the cumulative bandwidth balance deviates from a predetermined range, quantization is adjusted as needed to either improve image quality to more completely consume available bandwidth or to reduce image quality to thereby consume less bandwidth, See abstract). Wang is silent in regards to comprises multi-pass encoding means.

20. However, Boice teaches multi-pass encoding means (Boice, fig. 5 and 7).

21. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of Boice with Wang (modified by Wu) for enhancing picture quality of an encoded video sequence while still obtaining a high compression rate.

22. Regarding claim 10, Wang (modified by Boice and Wu) as a whole teaches everything as claimed above, see claim 1. Wang is silent in regards to an encoder as defined in claim 1 wherein the pre-encoding (Boice, encoder subsystem 1 (E1), fig. 5 and 7) means for pre-encoding the sequence of pictures for each of the plurality of quantization parameter values comprises means for re-using motion vector values (Boice discloses during a first pass of encoding, i.e., via subsystem E1, motion statistics based on motion vectors are calculated by encoding engine 410. Encoding subsystem E2 then outputs an encoded bitstream using a second pass through encoding engine 410, column 8 lines 39-44). Furthermore, the examiner takes the position since the motion vectors are used to calculate the motion statistics and then output to encoding subsystem 2, this would necessitate that the motion vectors are being used more than

one, or re-used. Further, it would be inherent that the motion vectors are re-used during the encoding and decoding process. The motion vectors that are obtained from the motion estimator would be the same motion vectors that are used in the motion compensator until a scene change is detected.

23. However, Boice teaches wherein the pre-encoding (Boice, encoder subsystem 1 (E1), fig. 5 and 7) means for pre-encoding the sequence of pictures for each of the plurality of quantization parameter values comprises means for re-using motion vector values (Boice discloses during a first pass of encoding, i.e., via subsystem E1, motion statistics based on motion vectors are calculated by encoding engine 410. Encoding subsystem E2 then outputs an encoded bitstream using a second pass through encoding engine 410, column 8 lines 39-44). Furthermore, the examiner takes the position since the motion vectors are used to calculate the motion statistics and then output to encoding subsystem 2, this would necessitate that the motion vectors are being used more than one, or re-used. Further, it would be inherent that the motion vectors are re-used during the encoding and decoding process. The motion vectors that are obtained from the motion estimator would be the same motion vectors that are used in the motion compensator until a scene change is detected.

24. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of Boice with Wang (modified by Wu) for enhancing picture quality of an encoded video sequence while still obtaining a high compression rate.

25. Regarding claim 11, Wang (modified by Boice and Wu) as a whole teaches everything as claimed above, see claim 1. In addition Wang teaches an encoder (Wang, fig. 1) as defined in claim 1 in combination with a decoder (Wang, fig. 11) for decoding encoded block transform coefficients (Wang, inverse discrete cosine transform, fig. 1) that meet network traffic model restrictions to provide reconstructed pixel data (Wang, frame reconstructor, fig. 1. It is clear to the examiner that in order to reconstruct the frame, it would be necessary for have reconstructed pixel data to comprise the reconstructed frame). Wang is silent in regards to the decoder comprising a variable length decoder (Wu, VLC decoding, fig. 2) for decoding video data corresponding to a time window having a preset duration according to a network traffic model (Wu, discloses where the video data is encoded according to preset time duration, column 14 lines 3-18. The examiner takes the position that if the video data is encoded with respect to a preset time duration, it would also be decoded according to a preset time duration.)

26. However, Wu teaches the decoder comprising a variable length decoder (Wu, VLC decoding, fig. 2) for decoding video data corresponding to a time window having a preset duration according to a network traffic model (Wu, discloses where the video data is encoded according to preset time duration, column 14 lines 3-18. Therefore, it is clear to the examiner that since the video data is encoded with respect to a preset time duration, it would also be decoded according to a preset time duration, which reads upon the claimed limitation).

27. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of Wu with Boice (modified by Wang) for Wu for providing a system that ensures that the bit rate of transmission matches the channel capacity.

28. Regarding claim 12, Wang (modified by Boice and Wu) as a whole teaches everything as claimed above, see claim 1. In addition, Wang teaches a codec (Wang, fig. 1) comprising an encoder (Wang, fig. 1) as defined in claim 1, and a decoder for decoding encoded block transform coefficients (Wang, inverse DCT, fig. 1) that meet network traffic model restrictions to provide reconstructed pixel data (Wang, frame reconstructor, fig. 1. It is clear to the examiner that in order to reconstruct the frame, it would be necessary for have reconstructed pixel data to comprise the reconstructed frame.). Wang is silent in regards to the decoder comprising a variable length decoder (Wu, VLC decoding, fig. 2) for decoding video data corresponding to a decoder time window having a preset duration according to a network traffic model (Wu, discloses where the video data is encoded according to preset time duration, column 14 lines 3-18. The examiner takes the position that if the video data is encoded with respect to a preset time duration, it would also be decoded according to a preset time duration.) pre-encoding the sequence of pictures for each of a plurality of quantization parameter values (Boice, using the calculated statistics, adaptive encoding of the video sequence is then carried out by controlling one of more encoding parameters of the real-time process. For example, bit allocation, quantization parameter(s), encoding mode, etc., can be changed from frame to frame or macroblock to macroblock within a given frame

according to derived statistics of a characteristic (e.g., scene content) of the particular frame(s), column 7 lines 30-39. Further disclosed, is encoder subsystem E1 is programmed to generate the desired statistics, which are important to the encoding subsystem's (E2) specific bit rate control algorithm, column 7 line 50-52 and column 8 line 1-5. The examiner takes the position that encoder #1 (E1) and controlling processor combined allow for pre-encoding; and the quantization(s) would be an important statistic needed for encoding subsystem E2 specific bit rate control algorithm); selecting for each picture of the sequence one of the plurality of quantization parameter values responsive to the quantization parameter values and bitrate operating points of the neighboring pictures in the sliding time window (Wang teaches where a primary open loop rate control selects an optimized quantization parameter Q, by determining a desired size for an individual frame and comparing the size of the frame as encoded to the desired frame. Wang also discloses where if the frame size is greater than the desired size, quantization parameter Q is increased to reduce the size of the subsequently encoded frames to consume less bandwidth; and if the encoded frame size is less than the desired size, quantization parameter Q is reduced to increase the size of the subsequently encoded frame to fully consume available bandwidth. Further, Wang teaches where each frame is encoded in a manner which maximizes image quality while approaching full consumption of available bandwidth and guarding against exceeding available bandwidth, column 4 lines 14-30. The examiner takes the position that the encoded video would be encoded to the response of the selected quantization parameters since the video is encoded depending on the adjusted quantization

parameter Q); and encoding each picture of the sequence using the quantization parameter value selected for that picture (Boice teaches the statistical processing is accomplished within a processor couple between the first and second encoder and to develop encoding parameters for the second encoder. The second encoder then uses the enhanced encoding parameters to provide high quality and highly compressed video stream, column 3 line 29-35, and fig. 7 and 8).

29. Regarding claim 13, the analysis and rejection made in claims 1-12 also apply here. Wang (modified by Boice and Wu) as a whole teaches a processor-based system. Hence a computer program for executing the necessary steps corresponding to the apparatus of claim 1 would have been inherent.

30. Regarding claims 14-22, the rejection and analysis made in claims 1-12 also apply. Claims 14-22 which recite a method for the corresponding apparatus would necessarily perform the method steps of claims 14-22.

31. In further regards to claim 14, Wang teaches a method of performing video rate control on a sequence of pictures to meet network traffic model restrictions, the method comprising: selecting for each picture of the sequence one of the plurality of quantization parameter values responsive to the quantization parameter values and bitrate operating points of the neighboring pictures in the sliding time window (Wang teaches where a primary open loop rate control selects an optimized quantization parameter Q, by determining a desired size for an individual frame and comparing the size of the frame as encoded to the desired frame. Wang also discloses where if the frame size is greater than the desired size, quantization parameter Q is increased to

reduce the size of the subsequently encoded frames to consume less bandwidth; and if the encoded frame size is less than the desired size, quantization parameter Q is reduced to increase the size of the subsequently encoded frame to fully consume available bandwidth. Further, Wang teaches where each frame is encoded in a manner which maximizes image quality while approaching full consumption of available bandwidth and guarding against exceeding available bandwidth, column 4 lines 14-30). The examiner takes the position that the encoded video would be encoded to the response of the selected quantization parameters since the video is encoded depending on the adjusted quantization parameter Q);

Wang is silent in regards to pre-encoding the sequence of pictures for each of a plurality of quantization parameter values; and encoding each picture of the sequence using the quantization parameter value selected for that picture.

However, Boice teaches pre-encoding the sequence of pictures for each of a plurality of quantization parameter values (Using the calculated statistics, adaptive encoding of the video sequence is then carried out by controlling one of more encoding parameters of the real-time process. For example, bit allocation, quantization parameter(s), encoding mode, etc., can be changed from frame to frame or macroblock to macroblock within a given frame according to derived statistics of a characteristic (e.g., scene content) of the particular frame(s), column 7 lines 30-39 . Further disclosed, is encoder subsystem E1 is programmed to generate the desired statistics, which are important to the encoding subsystem's (E2) specific bit rate control algorithm, column 7 line 50-52 and column 8 line 1-5 The examiner takes the position that

encoder #1 (E1) and controlling processor combined allow for pre-encoding; and the quantization(s) would be an important statistic needed for encoding subsystem E2 specific bit rate control algorithm. Boice further teaches and pre-encoding means for encoding each picture of the sequence using the quantization parameter value selected for that picture (Boice teaches the statistical processing is accomplished within a processor couple between the first and second encoder and to develop encoding parameters for the second encoder. The second encoder then uses the enhanced encoding parameters to provide high quality and highly compressed video stream, column 3 line 29-35, and fig. 7 and 8).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Wang with the technique of Boice for enhancing picture quality of an encoded video sequence while still obtaining a high compression rate by providing a real-time VBR a video encoding scheme.

Both Wang and Boice are silent in regards to a predetermined time window, however Wu et al., US 7,016,337 teaches where an encoder employs a "look a-head window" that is used to determine at what rate each channel must be sent. The "look a-head window" is used with the statistical re-multiplexer to determine to send out a number of bits corresponding to a time T for each of the channels, column 13 lines 65-67 and column 14 lines 1-20 and fig. 11.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of both Wang and Boice with the

technique of Wu for providing system that ensures that the bit rate of transmission matches the channel capacity.

32. Regarding claim 15, Wang (modified by Boice and Wu) as a whole teaches everything as claimed above, see claim 14. Wang is silent in regards to a method as defined in claim 14 wherein the sequence of pictures comprises a sequence of video frames.

33. However, Boice teaches wherein the sequence of pictures comprises a sequence of video frames (Boice, video encoder is constructed to be adaptive to the video data received as a sequence of frames, column 7 line 20-23).

34. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of Boice with Wang (modified by Wu) for providing enhancing picture quality of an encoded video sequence while still obtaining a high compression rate.

35. Regarding claim 16, see rejection for claim 4.

36. Regarding claim 17, see rejection for claim 5.

37. Regarding claim 18, see rejection for claim 6.

38. Regarding claim 19, see rejection for claim 7.

39. Regarding claim 20, see rejection for claim 8.

40. Regarding claim 21, see rejection for claim 9.

41. Regarding claim 22, see rejection for claim 10.

(10) Response to Argument

The Examiner's response to the arguments of the brief concerning the art rejection of claims 1 and 3-22 are as follows:

As to Appellant's argument that the rejection of Claims 1, 13 and 14 is improper because the modification of Wang with Boice would change the principal of operation of the invention in Wang.

The Examiner flatly disagrees. In response to Appellant's argument that the modification of Wang with Boice would change the principal of operation of the invention in Wang, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). Wang is concerned with rapid changes in the amount of change or motion in the motion video signal are detected by comparing the amount of change between two consecutive frames. Quantization is precompensated according to the measured rapid change, see abstract. Further, Wang discloses where the appropriate Q 114 for a given motion video signal depends on the particular subject matter of the particular motion video signal and, in fact, can change dramatically within a given motion video signal. Accordingly, Q 114 is controlled by a Q adjustor 116. Q adjustor 116 is shown in greater detail in Fig. 2. Q adjustor includes generally two Q adjustment mechanisms. The first includes a primary open loop rate and control 202

and a secondary closed loop rate control 204. The second includes a Q pre-compensator 206, col. 7 line 40-49. In step 504 (FIG. 5), Q pre-compensator 206 (FIG. 2) compares the absolute pixel difference received from absolute pixel difference generator 118 to the last absolute pixel difference previously received from absolute pixel difference generator 118. In test step 506 (FIG. 5), Q pre-compensator 206 (FIG. 2) determines if there is a significant increase, e.g., an increase of five (5) or more, in the absolute pixel difference. A significant increase suggests either a sudden increase in motion between the frames or an otherwise rapidly changing scene. Accordingly, prior estimates for an appropriate value for Q 114 by primary open loop rate control 202 and secondary closed loop rate control 204 are probably inappropriate for the current frame and the likelihood that the current frame, as encoded, will be too large given the current state of Q 114 is increased. Therefore, in such a case, processing transfers to step 508 (FIG. 5) in which Q pre-compensator 206 (FIG. 2) increases Q 114. Unlike steps 308 (FIG. 3) and 416 (FIG. 4) in which the current encoded frame is used to determine whether to adjust Q 114, in step 508 (FIG. 5) and in step 512 described below, Q pre-compensator 206 (FIG. 2) increases Q 114 prior to quantization of the current frame. As a result, de-stabilization of quantization in accordance with primary open loop rate control 202 and secondary closed loop rate control 204 by sudden changes in the motion video signal, e.g., sudden increases or decreases in motion, is avoided, Col. 11 line 55 to col. 12 line 13. Conversely, if Q pre-compensator 206 determines in test step 506 (FIG. 5) that there is no significant increase in the absolute pixel difference between the current and previous frames, processing transfers to test

step 510. In test step 510, Q pre-compensator 206 (FIG. 2) determines if there is a significant decrease, e.g., a decrease of five (5) or more, in the absolute pixel difference. A significant decrease suggests either a sudden decrease in motion between the frames or a scene with otherwise sudden decreases the amount of change between frames. Accordingly, prior estimates for an appropriate value for Q 114 by primary open loop rate control 202 and secondary closed loop rate control 204 are probably inappropriate for the current frame and the likelihood that the current frame, as encoded, will have unnecessarily poor quality given the current state of Q 114 is increased. Therefore, in such a case, processing transfers to step 512 (FIG. 5) in which Q pre-compensator 206 (FIG. 2) decreases Q 114. Q pre-compensator 206 increases Q 114 prior to quantization of the current frame in step 512 (FIG. 5) as described above, col. 12 line 16-34. Thus, Q pre-compensator 206 detects sudden changes in the amount of differences between frames of a motion video signal and pre-adjusts Q 114 in anticipation of such sudden changes. As a result, artifacts and undesirable effects resulting from such sudden changes are reduced considerable and, in cases avoided all together, col. 12 line 42-47. Boice discloses where a first encoding subsystem analyzes the sequence of video frames to derive information on at least one characteristic thereof, such as motion statistics, non-motion statistics, scene changes statistics, or scene fade statistics, see abstract.

Therefore, by incorporating the teaching of Boice where an encoding system analyzes a sequence of video frames to derive character information such as motion statistics, non-motion statistics, scene changes, or scene fades is disclosed with the

teachings of Wang whose concerned with detecting artifacts and undesirable effects that associated with sudden changes (increase or decrease in motion, rapidly changing scene or sudden decreases amount of change between frames) where the sudden changes are reduced and sometimes avoided all together, now discloses an encoding system that detects sudden motion changes in a sequence of video images using character information such as motion statistics, non-motion statics, scene changes, or scene fades.

Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of Boice with Wang to amplify the intended purpose of detecting sudden changes in a sequence of video that results in artifacts and undesirable effects where the artifacts and undesirable changes are reduced or avoided all together.

As to Appellant's argument that even if it is somehow determined that combination of Wang and Boice is proper, the rejection of claims 1, 13 and 14 would still be improper because the cited references fail to teach or suggest *"selecting for each picture of the sequence one of the plurality of quantization parameter values responsive to the quantization parameter values and bitrate operating points of the neighboring pictures in a predetermined time window"* as recited in Claims 1 and 14, and essentially, recited in Claim 13.

The Examiner respectfully disagrees. Wang discloses where the in accordance with the present invention, a primary open loop rate control selects an optimized

quantization parameter Q by determining a desired size for an individual frame and comparing the size of the frame as encoded to the desired size, (Wang, col. 4 line 15-18). Further disclosed by Wang is that in accordance with the present invention, motion video images which change from a slow changing scene to a rapidly scene are detected and quantization parameters Q is adjusted to more quickly adapted to the changing motion video signal and to continue to provide a particularly desirable compromise between image quality and available bandwidth. In particular, the absolute difference two consecutive frames is measured; the absolute pixel difference between the next two consecutive is measured; and the difference between the two consecutive absolute pixel differences is determined. If the magnitude of the difference between the differences is greater than a predetermined threshold, it is determined that the rate of the change in the motion video is changing rapidly and quantization parameter Q is changed accordingly notwithstanding changes to quantization parameter Q as determined by the primary open rate control and secondary closed loop rate control, . Thus, it is clear to the Examiner that the primary open loop rate control selects the quantization parameter Q based on the magnitude of the of the absolute difference of two consecutive frames. The Examiner is interpreting the two consecutive frames as being an analyzed window of neighboring frames. Thus, Wang discloses and more than fairly suggests the limitation as claimed. Further, Wang discloses where in accordance with the present invention, a secondary closed loop rate control ensures that overall available bandwidth is never exceeded. Quantization parameter Q is selected by accumulating a bandwidth buffer balance which represents the amount of available

bandwidth that which has not been consumed by encoded frames of a video image. The bandwidth buffer balance accumulates as time passes and is consumed by encoded frames which are transmitted through the communication medium whose bandwidth is measured. Encoding frames which are consistently slightly too large (fast), results in persistent dwindling of the reserve available bandwidth as represented in the bandwidth buffer balance. In response to the reduction of the bandwidth below a predetermined minimum threshold, quantization parameter Q is increased to reduce the size of subsequently encoded frames to consume less bandwidth at the expense of image quality. Encoding frames which are consequently slightly too small (slow) results in a persistent accumulation of reserve bandwidth available as represented in the bandwidth buffer balance. In response to the increase in the bandwidth buffer balance above a predetermined maximum threshold, quantization parameter Q is decreased to increase the size of subsequently encoded frames to improve image quality and to fully consume available bandwidth, (Wang, col. 4 line 30-53). Since the bandwidth dictates the amount of bit that can be transmitted, and Since Wang discloses a secondary close loop rate control ensures that overall bandwidth is never exceeded. Quantization parameter Q is selected by accumulating a bandwidth buffer balance which represents the amount of available bandwidth that which has not been consumed by encoded frames of a video image, it is clear to the Examiner that Wang discloses that the secondary closed loop rate control selects the quantization parameter based on the available bandwidth (which regulates the bit rate), which reads upon the claimed limitation.

As to Appellants argument regarding that Wang does teach that a quantization parameter is selected for encoding a frame. However, neither the cited passage, nor any other passage in Wang discloses that the selection of the quantization parameter is "responsive to ... the neighboring pictures in a predetermined window" as set for in the present claims.

The Examiner respectfully disagrees. Wang discloses where the in accordance with the present invention, a primary open loop rate control selects an optimized quantization parameter Q by determining a desired size for an individual frame and comparing the size of the frame as encoded to the desired size, (Wang, col. 4 line 15-18). Further disclosed by Wang is that in accordance with the present invention, motion video images which change from a slow changing scene to a rapidly scene are detected and quantization parameters Q is adjusted to more quickly adapted to the changing motion video signal and to continue to provide a particularly desirable compromise between image quality and available bandwidth. In particular, the absolute difference two consecutive frames is measured; the absolute pixel difference between the next two consecutive is measured; and the difference between the two consecutive absolute pixel differences is determined. If the magnitude of the difference between the differences is greater than a predetermined threshold, it is determined that the rate of the change in the motion video is changing rapidly and quantization parameter Q is changed accordingly notwithstanding changes to quantization parameter Q as determined by the primary open rate control and secondary closed loop rate control, . Thus, it is clear to the Examiner that the primary open loop rate control selects the

quantization parameter Q based on the magnitude of the of the absolute difference of two consecutive frames. The Examiner is interpreting the two consecutive frames as being neighboring frames. Thus, Wang discloses and more than fairly suggest the limitation as claimed.

Wang is silent in regards to a predetermined time window. However, Wu teaches where an encoder employs a "look a-head window" that is used to determine at what rate each channel must be sent. The "look a-head window" is used with the statistical re-multiplexer to determine to send out a number of bits according to a time T for each of the channels, (Wu, col. 14 lines 1-20). Therefore, it is the combination that teaches the limitations as claimed. In response to Appellant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

As to Appellants argument that since Wang does not refer to the neighboring pictures when selecting a quantization parameter, it logically follows that Wang further fails to teach that the selection of the quantization is responsive to the "quantization parameter values" and "bit rate operating points" of the neighboring pictures. Accordingly, for at least these reasons, Wang cannot be interpreted as teaching or suggesting "*selecting for each picture of the sequence one of the plurality of*

quantization parameter values responsive to the quantization parameter values and bitrate operating points of the neighboring pictures in a predetermined time window" as recited in Claims 1 and 14, and as essentially recited in Claim 13.

The Examiner respectfully disagrees and directs the Appellants to similar arguments.

As to Appellants argument regarding that neither of the other cited reference teach or suggest this feature either. In general, Boice teaches that the dual encoder system described therein can generate values for parameters, including a quantization parameter, by generating and analyzing statistics about a sequence of frames before they are encoded. However, this reference fails to disclose that quantization parameter values are selected which are responsive to the quantization parameter values and bitrate operating points of the neighboring pictures in a predetermined time window. Thus, this reference discloses little if any anything regarding the selection of quantization parameters. Accordingly, the present rejection is believed improper since all of the cited reference fails to teach or suggest the above-identified element of Claims 1, 13 and 14.

The Examiner respectfully disagrees, and directs the Appellant to similar arguments.

As to Appellants argument that the present rejection is also believed to be improper because the cited references, whether taken alone or in combination, fail to

teach or suggest *"pre-encoding the sequence of picture for each of a plurality of quantization parameter values"* as recited in Claims 1, 13, and 14.

The Examiner respectfully disagrees. Boice discloses where using the calculated statistics, adaptive encoding of the video sequence is then carried out by controlling one or more encoding parameters of the real-time process. For example, bit allocation, quantization parameter(s), encoding mode, etc can be changed from frame to frame or macroblock to macroblock within a given frame according to derived statistics of a characteristic (e.g., scene content) of the particular frame(s), (Boice, col. 7 line 30-39). Further, disclosed is that E1 is programmed to generate the desired statistics, such as interframe/intraframe non-motion, motion etc. statistics, which are important to the encoding subsystem (E2) specific bit rate control algorithm. E2 generates encoded frames based on the statistics generated by encoding subsystem E1, col. 7 line 50 to col. 8 line 1-5, fig. 5, 7-9. Moreover, Boice discloses where the encoding subsystem E1 calculates statistics from the image data. Based upon the statistics, the sub-system can also carry out pre-processing steps, such as identifying scene changes or fade detection. The particular statistics calculated by subsystem E1 depend on the given implementation of a rate control algorithm within subsystem E2. In MPEG-2 encoding, there is a wide range of picture statistics that can be used to determine the quantization for a frame or within a frame, (Boice, col. 9 line 9-20). Therefore, it is clear to the Examiner that Boice more than fairly discloses and suggests that subsystem E1 pre-encodes image data and quantization parameter prior to the final encoding performed by subsystem E2, which reads upon the claimed limitation.

As to Appellants argument that the cited passages along with other passages in Boice, fail to explicitly recite that this dual encoder system involves pre-encoding a sequence of pictures, and further that such pre-encoding is done "for each of a plurality of quantization parameter values". Furthermore, any argument that the statistical gathering performed by the first encoding system would suggest pre-encoding a sequence of pictures for each of a plurality of quantization parameter values would constitute an improperly broad interpretation of Boice. When given its broadest interpretation, Boice teaches that statistical information regarding a sequence of pictures can be gathered in order to alter a parameter (e.g. a quantization parameter) which is used to encode the sequence of pictures. However, even when Boice is given its broadest interpretation, this reference fails to teach or suggest "*pre-encoding the sequence of pictures for each of a plurality of quantization parameter values*" as recited in Claims 1, 13, and 14.

The Examine respectfully disagrees and directs the Appellant to the previous response. Further, in response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

As to Appellants argument that the other cited reference, Wu fails to cure the deficiencies of Wang and Boice with respect to disclosing the above-identified element. As mentioned briefly above, it appears that Wu was only cited for the limited purpose of disclosing a "predetermined time window". However, regardless of whether Wu actually discloses a "predetermined time window" as the Examiner contends, the rejection of Claims 1, 13, and 14 is improper since Wu, like the other cited references, fails to teach or suggest anything about pre-encoding a sequence of pictures for each of a plurality of quantization parameter values.

The Examiner respectfully disagrees. It is the combination of the Boice (modified by Wang and Wu) that teaches the limitations as claimed. In this case, Wang teaches an encoder (fig. 1) for encoding a sequence of pictures as a plurality of block transform coefficients (direct cosine transformation (DCT) on the motion-compensated macroblocks of the motion-compensated frame to produce a transformed frame, column 6 line 56-59 and fig. 1) to meet network traffic model restrictions (motion video signal encoder maximizes image quality without exceeding transmission bandwidth available, See abstract), the encoder comprising an iterative loop for selecting one of a plurality of quantization parameter values for each picture (a primary open rate loop control selects an optimized quantization parameter Q by determining a desired size for an individual frame, column 4 line 14-16. Furthermore, the examiner takes the position that a loop is a reiteration of a set of instructions in a routine or program) said iterative loop

comprises: selecting means for selecting each picture of the sequence one of the plurality of quantization parameter values responsive to the quantization parameter values and bitrate operating points of the neighboring pictures in a predetermined time window (Wang discloses where the in accordance with the present invention, a primary open loop rate control selects an optimized quantization parameter Q by determining a desired size for an individual frame and comparing the size of the frame as encoded to the desired size, (Wang, col. 4 line 15-18). Further disclosed by Wang is that in accordance with the present invention, motion video images which change from a slow changing scene to a rapidly scene are detected and quantization parameters Q is adjusted to more quickly adapted to the changing motion video signal and to continue to provide a particularly desirable compromise between image quality and available bandwidth. In particular, the absolute difference two consecutive frames is measured; the absolute pixel difference between the next two consecutive is measured; and the difference between the two consecutive absolute pixel differences is determined. If the magnitude of the difference between the differences is greater than a predetermined threshold, it is determined that the rate of the change in the motion video is changing rapidly and quantization parameter Q is changed accordingly notwithstanding changes to quantization parameter Q as determined by the primary open rate control and secondary closed loop rate control, . Thus, it is clear to the Examiner that the primary open loop rate control selects the quantization parameter Q based on the magnitude of the of the absolute difference of two consecutive frames. The Examiner is interpreting the two consecutive frames as being neighboring frames. Thus, Wang discloses and

more than fairly suggest the limitation as claimed. Further, Wang discloses where in accordance with the present invention, a secondary close loop rate control ensures that overall available bandwidth is never exceeded. Quantization parameter Q is selected by accumulating a bandwidth buffer balance which represents the amount of available bandwidth that which has not been consumed by encoded frames of a video image. The bandwidth buffer balance accumulates as time passes and is consumed by encoded frames which are transmitted through the communication medium whose bandwidth is measured. Encoding frames which are consistently slightly too large results in persistent dwindling of the reserve available bandwidth as represented in the bandwidth buffer balance. In response to the reduction of the bandwidth below a predetermined minimum threshold, quantization parameter Q is increased to reduce the size of subsequently encoded frames to consume less bandwidth at the expense of image quality. Encoding frames which are consequently slightly too small results in a persistent accumulation of reserve bandwidth available as represented in the bandwidth buffer balance. In response to the increase in the bandwidth buffer balance above a predetermined maximum threshold, quantization parameter Q is decreased to increase the size of subsequently encoded frames to improve image quality and to fully consume available bandwidth, (Wang, col. 4 line 30-53). Since the bandwidth dictates the amount of bit that can be transmitted, and Since Wang discloses a secondary close loop rate control ensures that overall bandwidth is never exceeded. Quantization parameter Q is selected by accumulating a bandwidth buffer balance which represents the amount of available bandwidth that which has not been consumed by encoded frames of a video

image, it is clear to the Examiner that Wang discloses that the secondary closed loop rate control selects the quantization parameter based on the available bandwidth (which regulates the bit rate), which reads upon the claimed limitation).

Wang is silent in regards to a pre-encoding means for pre-encoding means for pre-encoding the sequence of pictures for each of a plurality of quantization parameters values; encoding means for encoding each picture the sequence using the quantization parameter value selected for that picture.

However, Boice teaches a pre-encoding means for pre-encoding the sequence of pictures for each of a plurality of quantization parameter values (Boice discloses where using the calculated statistics, adaptive encoding of the video sequence is then carried out by controlling one or more encoding parameters of the real-time process. For example, bit allocation, quantization parameter(s), encoding mode, etc can be changed from frame to frame or macroblock to macroblock within a given frame according to derived statistics of a characteristic (e.g., scene content) of the particular frame(s), (Boice, col. 7 line 30-39). Further, disclosed is that E1 is programmed to generate the desired statistics, such as interframe/intraframe non-motion, motion etc. statistics, which are important to the encoding subsystem (E2) specific bit rate control algorithm. E2 generates encoded frames based on the statistics generated by encoding subsystem E1, col. 7 line 50 to col. 8 line 1-5, fig. 5, 7-9. Moreover, Boice discloses where the encoding subsystem E1 calculates statistics from the image data. Based upon the statistics, the sub-system can also carry out pre-processing steps, such as identifying scene changes or fade detection. The particular statistics calculated by subsystem E1

depend on the given implementation of a rate control algorithm within subsystem E2. In MPEG-2 encoding, there is a wide range of picture statistics that can be used to determine the quantization for a frame or within a frame, (Boice, col. 9 line 9-20). Therefore, it is clear to the Examiner that Boice more than fairly discloses and suggests that subsystem E1 pre-encodes image data and quantization parameter prior to the final encoding performed by subsystem E2, which reads upon the claimed limitation) and the encoding means for encoding each picture the sequence using the quantization parameter value selected for that picture (Boice teaches the statistical processing is accomplished within a processor coupled between the first and second encoder and to develop encoding parameters for the second encoder. The second encoder then uses the enhanced encoding parameters to provide high quality and highly compressed video stream, column 4 line 29-35, fig. 7-8).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Wang with the technique of Boice for enhancing picture quality of an encoded video sequence while still obtaining a high compression rate by providing a real-time VBR a video encoding scheme. Further, Wang is concerned with rapid changes in the amount of change or motion in the motion video signal are detected by comparing the amount of change between two consecutive frames. Quantization is precompensated according to the measured rapid change, see abstract. Boice discloses where a first encoding subsystem analyzes the sequence of video frames to derive information on at least one characteristic thereof, such as motion statistics, non-motion statistics, scene changes statistics, or scene fade statistics, see

abstract. Therefore, by incorporating the teachings of Boice with Wang would improve the detection of rapid changes in the video signal.

Wang (modified by Boice) is silent in regards to predetermined time window technique, however Wu teaches where an encoder employs a "look a-head window" that is used to determine at what rate each channel must be sent. The "look a-head window" is used with the statistical re-multiplexer to determine to send out a number of bits corresponding to a time T for each of the channels, (Wu, col. 13 line 65 to col. 14 line 1-20 and fig. 11).

Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention was made to combine the teachings of both Wang and Boice with the technique of Wu for providing a system that ensures that the bit rate of transmission matches the channel capacity.

In response to Appellant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Jessica Roberts/

Examiner, Art Unit 2621

04/22/2010

Conferees:

/Andy S. Rao/

Primary Examiner, Art Unit 2621

May 7, 2010

/Marsha D. Banks-Harold/

Supervisory Patent Examiner, Art Unit 2621